

GIA Environmental Health and Safety Cyanide Safety Standard

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ABSTRACT: The purpose of this GIA standard is to define the basic elements and responsibilities to ensure the proper use, storage, transportation, handling, and disposal of cyanide compounds.

APPLICABILITY: This standard shall apply to GIA facilities and operations worldwide unless superseded by more stringent country and/or local regulations.

STATUS: APPROVED 24-Jun-1991; use VTX SMC for current status.

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1 INTRODUCTION

The purpose of this GIA standard is to define the basic elements and responsibilities to eliminate potential hazards involved in the use, storage, transportation, handling, and disposal of cyanide compounds.

1.1 SCOPE

This standard shall apply to GIA facilities and operations worldwide unless superseded by more stringent country and/or local regulations.

1.1.1 Policy

Cyanide compounds may only be used after a documented assessment of the safety, health, and environmental hazards have been compiled, required controls are in place, and training has been conducted for those potentially exposed.

1.2 RESPONSIBILITIES

- Site Manager

Ensure that a process exists to assure that usage of cyanide compounds on-site or within the operation is reviewed for potential safety, health, and environmental hazards, that controls are in place, and that training is conducted for those potentially exposed.

Ensure that a process is in place to assure when a choice exists, that the least hazardous material is used in a particular situation.

- Department Manager

Ensure that all employees involved in the use, storage, transportation, handling, and disposal of cyanide compounds are properly protected and trained to follow safe operating procedures and practices.

Ensure that cyanide compounds are introduced for use only after they have been evaluated for potential safety, health, and environmental hazards; proper controls are in place; and proper training has been conducted for those potentially exposed.

Ensure that there are ongoing self-audits for unsafe acts and/or conditions and that deficiencies are promptly corrected.

- Supervisor

Review each operation that involves the use of cyanide compounds and evaluate potential hazards with the assistance of site EH&S.

Ensure that all cyanide compounds have been reviewed through the site chemical approval process before being introduced into the work area.

Ensure that all employees are trained in safe cyanide handling procedures, that the training is documented, and that records are maintained by EH&S in department files, in personnel files, and/or in a central location.

Maintain a current file of accurate and up-to-date Material Safety Data Sheets (MSDSs) for cyanide compounds being used in the work area.

Ensure that all employees who may potentially be involved in the use, storage, transportation, handling, and disposal of cyanide compounds know how to obtain and use the appropriate MSDSs.

Ensure that all employees are supplied with, trained, and use appropriate personal protective equipment (PPE), as required.

Enforce the use of PPE in operations where it is required.

Ensure that cyanide safety procedures are documented and followed.

- Employees

Use, store, transport, handle, and dispose of cyanide compounds only after having received the proper training and being properly protected.

- Site Environmental Health and Safety (EH&S)

Provide EH&S review and recommendations for the introduction, use, storage, transportation, and handling of cyanide compounds prior to their inclusion into a process or operation.

Assist department managers and supervisors in the evaluation of potential safety and health issues as well as what controls and facilities may be required for the proper use, storage, transportation, handling, and disposal of cyanide compounds.

Conduct periodic cyanide exposure monitoring and process/work practice reviews. Based on these activities, it may be determined that the installation of in-place monitoring equipment may be appropriate.

Maintain a current file of accurate and up-to-date MSDSs for cyanide compounds used on-site and in related operations.

Assist department managers and supervisors in providing training for potentially exposed employees in the required aspects of cyanide safety.

Evaluate and assist in the selection of PPE for use in areas using cyanide compounds.

- Health Services

Develop and provide training for specific cyanide emergency first-aid procedures.

Assist in the determination of specific training needs and the location of oxygen and cyanide antidote kits.

1.3 LANGUAGE REQUIREMENT FOR THIS STANDARD

The details of this standard and all documentation associated with it, such as manuals, training materials, signs, labels, postings, and so forth, must be available in English and the accepted and official local languages.

2 HAZARD INFORMATION

This heading describes hazards and dangers of cyanide compounds.

2.1 DESCRIPTIONS

Cyanides: Solid salts or solutions of salts, including wastes

These materials should pose little excessive risk in normal use if handled properly and airborne levels are maintained below stated occupational exposure limits (for example, from dust generation during transfer of the solid from bulk for bath make-up and from misting as a result of bath agitation), and if skin contact is prevented during use.

Hydrogen Cyanide Gas:

Highly toxic. Formed as a result of the mixing of a cyanide with an acid or other oxidizer. With the proper procedures, controls, and planning this occurrence can be prevented. Should a release or exposure occur, procedures must be in place to ensure the safety of employees and emergency response personnel.

2.2 SOLID OR LIQUID CYANIDE COMPOUNDS

Reactivity with acids is the primary hazard presented by solid or liquid cyanide compounds. These reactions have the following characteristics.

Very rapid chemical reaction.

Formation and liberation of hydrogen cyanide gas that is extremely toxic.

Amount of hydrogen cyanide gas released is dependent upon the concentration of both the cyanide solution and acid which may have been accidentally mixed.

Hydrogen cyanide is acutely toxic when inhaled. If enough is inhaled at one time, toxic effects will occur immediately, or within several hours. A very high single exposure can cause death by chemical asphyxiation.

Cyanide salts are nonvolatile; if they are kept dry and stored separately from acids and other oxidizers, they do not evaporate or give off hazardous gases.

If cyanide salts or mists from solutions become airborne, the potential hazard is dependent upon the amount, or concentration, of cyanide present. Symptoms include:

Weakness, headaches, confusion, nausea, vomiting, or increased rate and depth of respiration or slow and gasping respiration.

Asphyxiation and death at high concentrations

The following is a table of air concentrations of hydrogen cyanide and their corresponding health effects.

Parts Per Million	Effect
2 to 5	Odor threshold (smell of bitter almonds)
10	Occupational health limit time weighted average for a normal 8-hour workday
20 to 40	Slight symptoms after several hours
45 to 54	Tolerated for 1/2 to 1 hour without immediate or delayed effects
100 to 240	Fatal within 1/2 to 1 hour
300	Rapidly fatal

Cyanides, in general, can be absorbed through the skin and will exhibit toxic effects.

3 USER TRAINING

All personnel who use, store, transport, handle, and dispose of cyanide compounds shall attend an initial cyanide safety training session prior to working with the substance.

Security personnel with emergency response responsibilities must undergo awareness training, as a minimum.

Initial training shall be supplemented by training repeated annually.

EH&S will assist in providing the training.

4 CYANIDE ANTIDOTE KITS

All departments using cyanide shall be provided with a cyanide antidote kit. The kit shall be stocked and maintained by Health Services

- It shall be located near the point of cyanide use.
- It shall be placed in a box with a breakable glass panel or a break away lock so that it is secure until needed.
- It shall not be located in the same area where the potential emergency might possibly occur.
- It shall be inspected monthly.

5 SAFE WORK PRACTICES

This section describes safe work practices for the storage, transportation, uses, PPE, container labelling, disposal, and emergency response.

5.1 STORAGE OF CYANIDES

All containers of cyanide, whether the original manufacturer's package or a temporary use container, shall be:

Stored separately from other chemicals

Stored in a locked cabinet or enclosure in such a manner that a spill or accidental mixture with acids and other oxidizers is prevented

Stored elevated above the floor

Stored on pallets, racks, shelves, or in cabinets that are separate from but not above nor below acids or other oxidizers

5.2 SECONDARY CONTAINMENT

Liquid cyanide solutions shall be used in an area that provides secondary containment in the event the primary container should break. Examples include but are not limited to the following.

Beakers containing cyanide solutions shall be kept inside a sink, containment pan, or inside a larger beaker.

Large tanks containing cyanide solutions shall either be double-walled or placed in an area so that any potential leak is contained.

5.3 TRANSPORT OF CYANIDES

Cyanides, regardless of form, shall not be transported on a pallet or cart with acids.

Liquid cyanide solutions shall be transported by chemical carts dedicated to cyanide use. The designated cart shall be used exclusively for cyanides, and shall be so labeled.

5.4 USES

Cyanide solutions of greater than 1% cyanide shall be maintained at a pH of 12 or greater. In general, a pH of 12 can be achieved by adding 0.5% by weight of sodium hydroxide to the mixture.

When making a solution which requires the addition of a caustic solution for pH control, always add the caustic solution to the water prior to adding cyanide.

Cyanide solutions shall be kept in plastic containers suitably resistant against corrosion from caustic solutions. The use of glass containers is restricted solely to the point of use, and then only with secondary containment.

Cyanide shall not be used on the same workbench and at the same time as acids unless both acid and cyanide are kept separate and within secondary containment.

Any workpiece or tool contaminated with cyanide shall be rinsed with water prior to contact with acids or treated with sodium hypochlorite.

Open cyanide containers or solutions shall be used only with accompanying local exhaust ventilation, such as inside a lab hood or properly vented plating tank.

5.5 PERSONAL PROTECTIVE EQUIPMENT

Open transfer or addition of significant quantities of any cyanide compound shall be conducted by personnel wearing full protective equipment including full-length rubber gloves, apron with attached sleeves, face shield, and safety glasses or goggles. Details of the use of PPE shall be decided by both department management and EH&S.

Protective gloves shall be used where there is immersion or deliberate contact with cyanides. Glove material choices include nitrile, butyl, or neoprene rubber.

Protective equipment contaminated with acids shall not be used when handling cyanides.

Protective equipment contaminated by cyanide shall be rinsed with water and sodium hypochlorite and properly disposed.

Disposable gloves or apparel shall be placed in a separate safety disposal can labeled as *CYANIDE SOLID WASTE*. Noncyanide wastes shall not be placed into these containers.

IH sampling shall be performed to evaluate airborne cyanide exposure during use, transfer, and handling to assure that PPE and controls are sufficient.

5.6 CONTAINER LABELING

All cyanide containers shall have a distinct warning label affixed to identify the particular cyanide compound. Labels shall be reviewed by the EH&S.

5.7 WASTE DISPOSAL

All waste-working cyanide solutions shall be transferred by the user into plastic or other suitable waste containers as identified by EH&S and/or waste treatment.

The cyanide liquid waste container shall be used solely for that purpose. It shall be labeled with the words *CYANIDE LIQUID WASTE*, or the name of the particular cyanide compound.

The process and method by which waste solutions are removed to the designated holding area from areas of use shall be predetermined by EH&S and/or waste treatment.

Cyanide solutions or solids shall not be discharged into sinks unless specifically labeled *CYANIDE WASTE ALLOWED*, as identified by EH&S and/or waste treatment.

Waste cyanide solids shall be collected in a safety can, or double plastic bag, used solely for that purpose, and shall be labeled with the words *CYANIDE SOLID WASTE*.

The method by which cyanide solids are to be disposed shall be predetermined by EH&S and/or waste treatment.

5.8 EMERGENCY RESPONSE

If cyanide and acid are known to have been accidentally mixed in the open:

1. All personnel must **EVACUATE THE BUILDING IMMEDIATELY**.
2. Call Security.
 - a. Describe the incident
 - b. Report *the mixing of an acid and cyanide solution*
 - c. Provide the location, other details, and if there have been any injuries.
 - d. Request a Chemical Spill Team response and, if necessary, a medical Emergency Response Team to the scene.

DO NOT RE-ENTER THE AREA until the Chemical Spill Team has issued the all clear announcement. Depending on the situation, it may be advisable to allow the reaction to continue and permit the hydrogen cyanide to dissipate before anyone re-enters the area.

Cyanide spill response:

A contingency plan shall be in place to address the site-specific needs and the potential hazard involved. Of concern are details such as the amount of cyanide present, how and where it is used, communication and notification, evacuation procedures, medical response, PPE, and spill containment and control equipment.

As instructed by EH&S or waste treatment, minor spills of liquid cyanide solution in an open area (outside of a lab hood), may be cleaned using approved spill pillows or other means, and may be disposed of as **CYANIDE SOLID WASTE**.

Larger cyanide spills in the open require a trained response that includes participation with:

- Security: To coordinate communications and secure or isolate the area where the spill occurred.
- Chemical Spill Team: To conduct the safe cleanup and disposal of the cyanide waste materials.

IN ALL CASES, AFTER THE CHEMICAL SPILL TEAM ARRIVES, THE CHEMICAL SPILL TEAM HAS COMPLETE AUTHORITY TO INITIATE AN EVACUATION AND TO AUTHORIZE THE ALL CLEAR ANNOUNCEMENT.

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